Application of workflow management system to the modelling of processes in land administration systems

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Background

• Efficiency – important in every administrative domain
  • Land administration as well
• WFMS -> efficient process management
• Transactional WFMS
  • Integration of transactional concepts
  • Ensuring consistency of data
Research idea

- Increase efficiency of land administration
  - Application of WFMS
  - Netherlands (van Osch and Lemmen, 2004)
  - Indonesia (Sari, 2010)
- Processes over spatial data are complex
- If spatial data are supported than non-spatial should be also
- Problem
  - Only a few papers for transactions/processes over spatial data
Research approach

• Questions:
  • Can transactional WFMS be used to model processes over spatial component of LA data
  • How could LADM be extended to support processes using transactional WFMS
• Test case on polygon based cadastral parcels
• Conceptual data model of transactional WFMS
Workflow management system

• Result of need for more efficient and flexible process management
• Support for collaboration of users
• Support for heterogenous IT environments
  • Web services
  • Invoking applications
  • Executing SQL queries and DB procedures
  • Blockchain technology
• Disadvantages
  • Weak support for consistency and
  • Recovery in case of failure
Transactional WFMS

• Overcome disadvantages of WFMS
• Integration of transactions and WFMS (Grefen & Vonk, 2006)
• Spatial WFMS
  • Weak or no support for transactional concepts
  • Complex collaborative operations on spatial data
Modelling of processes

• Various notations
  • BPMN
  • UML AD
  • WF(Petri) nets

• Petri nets
  • Solid mathematical background
  • Simple notation
Generic conceptual model
Test case


• Transaction type
• Planar partition
• Parcel version overlapping
Support for spatial component of parcels

• Spatial definition of affected area
• Ensuring geometric and topological correctness
  • Integrity constraints from (Vranić et al., 2015)
• Ensuring serializability
  • Pessimistic manner
• Locking parcels in the affected area
Integration of WFMS to LADM

- Case is descendant of a source
- Relationships to other descendants
  - LA_AdministrativeSource
  - LA_SpatialSource
- Reflexive relationship
  - checkedOutVersion
- Double relationship
  - caseCreated
  - caseDestroyed
  - With single update, status of all affected objects is changed
Conclusion

• Processes on polygon-based cadastral parcels can be modelled
• Transactional WFMS can ensure consistency
  • Application of ACID properties on a process level
  • Application of integrity constraints for spatial component
• Transactional WFMS can be integrated into LADM
  • General associations WF_Case <-> VersionedObject
  • Associations WF_Case <-> CP_Parcel
• Other approaches were tested
  • Optimistic
  • Altruistic
Further research

• Support for other spatial data structures such as topological
• Application of other (than ACID) correctness criteria
  • Such as relaxation of atomicity

Thank you. Questions?